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ABSTRACT

Two studies explored conditions in which preschoolers can understand and apply effective elaboration mnemonics. In the first experiment, 24 preschoolers ranging in age from 3 years, 10 months, to 5 years, 5 months were randomly assigned to interaction, no interaction, and control conditions. The experiment was designed to determine whether preschoolers can effectively use an elaboration mnemonic to enhance serial learning without specific instruction during retrieval, and whether preschoolers can generate their own associative images during encoding. Findings of the experiment demonstrated that preschoolers can successfully use a sophisticated elaboration mnemonic to enhance serial recall, even without specific retrieval cues. Under certain conditions, they can effectively generate their own relational imagery. In the second experiment, 27 preschoolers ranging in age from 3 years, 4 months, to 5 years, 2 months were randomly assigned to image generating, image and mnemonic generating, and control conditions. This experiment was designed to determine whether preschoolers can effectively transfer their knowledge to other, similar tasks, even without being told to do so, once they have learned a mnemonic strategy. The experiment demonstrated that preschoolers have the ability to transfer mnemonic strategies to different situations involving the same kind of learning task. (RH)

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Teaching Preschool Children to Generate and Apply Mnemonic Strategies

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Objectives

Research in the last ten years suggests that very young children can significantly improve their memory by using elaboration mnemonics (Kail, 1984; Pressley, 1982; Watkins & Schadler, 1980). However, it is generally difficult to determine the full competence of preschool children to learn mnemonic strategies because of their sensitivity to nuances of the learning task and to the features of the surrounding environment. For instance, mnemonic strategies for associative learning are effective only when children are supplied with specific instructions at retrieval (Pressley & Levin, 1980; Pressley & MacFayden, 1983). Moreover, because of the variability in performance, it is not clear whether preschool children are able to generate their own mnemonic strategies or whether they are able to transfer these strategies to other, similar tasks (Pressley, 1982).

This study addressed several theoretical issues involving encoding, retrieval, and transfer of mnemonic strategies, exploring and delineating the conditions under which preschool children can understand and apply effective elaboration mnemonics. Using the Method of Loci--a relatively untested mnemonic method, this study extended current research in four ways: 1) Preschool children were instructed in serial learning--a difficult learning task; 2) Specific retrieval cues were not supplied; 3) In some experimental conditions, relational imagery was not provided during encoding; and 4) Transfer of training was assessed.

Perspectives

The method of loci is a spatial mnemonic that can dramatically improve serial recall with adults (Higbee, 1988; Yates, 1966). To use this mnemonic, subjects visualize a familiar path--a mental walk--and form interactional images associating each word or phrase to be remembered with a particular location along the path. During testing, subjects simply visualize the annotated path, recalling each word or phrase, in order, as they move along the path (Lorayne & Lucas, 1974; Yates, 1966). Casual demonstrations of this mnemonic are convincing, and there have been a few studies with adults that have validated its effectiveness (Bower, 1970; Ross & Lawrence, 1968; Hayes, 1981).

Pilot work by Kraft and Grounds (1985) suggested that a modified version of the Method of Loci can be taught to young children to enhance their otherwise lackluster performance on serial learning tasks. Preschool children were shown the gameboard to "Candyland," a game for young children (Figure 1). The experimenter presented a list of words, pointed to specific locations on the gameboard, and told each child to imagine the meaning of each word interacting with the location in a specified manner. Children who used the method of loci recalled over 80% of the words in the correct order, whereas control participants recalled less than 25%.

Insert Figure 1 about here

Experiment 1

The initial work by Kraft and Grounds (1985) represented a good point of departure to explore more theoretical questions involved in teaching mnemonic strategies to preschool children. In Experiment 1, two general questions were explored: Can preschool children effectively use an elaboration mnemonic to enhance serial learning--without specific instructions during retrieval? Can preschool children generate their own associative images during encoding?

Method

In Experiment 1, 24 preschool children ranging in age from 3-10 to 5-5 (mean age = 4 years, 5 months) were randomly assigned to three conditions: 1) Interaction, 2) No Interaction, and 3) Control. Subjects in all three conditions were trained and tested individually. Each subject was presented with a list of ten concrete nouns to learn and remember. The first two groups were shown the gameboard to "Candyland," a game for young children (Figure 1). In the Interaction condition, the experimenter presented the words, pointed to a specific location on the gameboard, and told each subject to imagine the object denoted by each word interacting with the location in a specified manner. (See Table 1.) (None of the words bore any prior relationship to the gameboard scenes.) For example, the first word on the list was "ball," and the first location depicted a boy and a girl; the experimenter pointed to the location and said, "imagine the girl kicking a ball." In the No Interaction condition, the procedure was the same, except that subjects were not given specific actions associating the locations and the words. The experimenter simply

pointed to a particular location and gave the general instruction, "picture the object in this place on the board." Control subjects were presented with the same list of words and were given sentences that described the interactions between locations and objects that were provided to the Interaction group. After each word was presented, it was used in a sentence, with the target word stressed.

Insert Table 1 about here

Serial recall was tested immediately and after a 48-hour delay. In the two Loci conditions (Interaction and No Interaction), the experimenter simply pointed to the locations on the gameboard and asked for the corresponding word. No references were made to the interactional imagery used during encoding. In the Control condition, the subjects were asked to recall as many words, in order, that they could. A 3 (Interaction vs. No Interaction vs. Control) by 2 (immediate vs. 48-hour recall) mixed-design analysis of variance was conducted, accompanied by appropriate paired comparisons.

Results

The results are shown in Figure 2. During immediate recall, Interaction subjects recalled over 80% of the words in the correct order; No Interaction subjects recalled 60%; Control subjects 22%. After 48 hours, serial recall fell to 67%, 48%, and 17% for the Interaction, No Interaction, and Control conditions, respectively. There were significant effects of mnemonic strategy [$F(2,21) = 37.45$, $p < .01$] and recall delay [$F(2,21) = 20.36$, $p < .01$] A Newman-Keuls analysis revealed that each Loci group recalled

significantly more words than the Control group on both immediate and delayed recall. The difference between the Interaction and No Interaction conditions was appreciable but not significant. This experiment demonstrated that preschool children can successfully use a sophisticated elaboration mnemonic to enhance serial recall, even without specific retrieval cues, and that these children can effectively generate their own relational imagery as long as they have an observable path to follow.

Insert Figure 2 about here

Experiment 2

The next general question addressed in this study was the following: Once the mnemonic strategy is learned, can preschool children effectively transfer their knowledge to other, similar tasks, even without being explicitly told?

Method

In Experiment 2, 27 preschool children ranging in age from 3-4 to 5-2 (mean age = 4 years, 1 month) were randomly assigned to three conditions: 1) Image generating (Image), 2) Image and mnemonic generating (Image Plus), and 3) Control. As before, subjects were trained and tested individually. The first two groups were trained to use the modified version of the Method of Loci; the control group received no such training. During Loci training, subjects were shown the gameboard to "Babar." The experimenter presented a practice list of ten words, pointed to specific locations on the gameboard, and provided images relating

the words to the locations. (See Table 2.) The subjects were taught how to use locations on the board and the relational images to help remember the words. These subjects received one practice trial of serial recall and responded with nearly 90% accuracy. Control subjects were instructed to try to remember the list of words in order.

Forty-eight hours later all the groups were given ten new words to learn and remember. The two groups of Loci-trained subjects (Image and Image Plus) were presented with the gameboard to Candyland, very different in appearance from "Babar." Image subjects were reminded how to use the Loci mnemonic and then asked to generate their own relational images; Image Plus subjects were not reminded about the mnemonic or the relational images. As before, control subjects were presented with the list of words and were simply instructed to remember them in order. Serial recall was tested immediately and after a 48-hour delay. A 3 (Image vs. Image Plus vs. Control) by 2 (immediate vs. 48-hour recall) mixed-design analysis of variance was conducted.

Insert Table 2 about here

Results

The results are shown in Figure 3. During immediate recall, Image subjects recalled 70% of the words in the correct order; Image Plus subjects recalled 60%; Control subjects just over 20%. After 48 hours, serial recall fell to 55%, 36%, and 11%, for the Image, Image Plus, and Control conditions, respectively. There were significant effects of Loci training [$F(2,24) = 13.89$, $p < .01$] and recall delay [$F(1,24) = 52.23$, $p < .001$]. A Newman-Keuls

analysis revealed that the Image and Image Plus groups recalled significantly more words than the Control group on both immediate and delayed recall. In general, Experiment 2 demonstrates that preschool children have the ability to transfer mnemonic strategies to different situations involving the same kind of learning task.

Insert Figure 3 about here

Educational Importance

Preschool children can be taught to use a sophisticated mnemonic method to enhance serial learning. Under the appropriate conditions, these children can generate their own relational imagery and effectively apply this imagery, enhancing their serial recall. Improvements in recall can be maintained over time and are not dependent on specific retrieval instructions. Overall, preschool children enjoyed using the Method of Loci and had very little trouble attending to the task. In fact, preliminary follow-on work indicated that children were eager to participate again the following year and were able to recall, in order, the words they learned one year earlier. In terms of praxis, very young children may be able to improve their performance on various classroom tasks involving serial learning.

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Table 1

Information used by the participants in Experiment 1

Words to be Remembered	Location	Associations provided by the Experimenter
1. Ball	Boy & Girl	"The girl is kicking the ball."
2. Table	Hearts	"The hearts are lying on the table."
3. Apple	Candy Canes	"The apple is hanging from the candy cane."
4. Mother	Gumdrops	"The mother gives you gumdrops."
5. Car	Gingerbread Man	"The car is flattening the gingerbread man."
6. Chair	Old House	"The chair is inside the old house."
7. Pot	Lollipops	"The pot contains the lollipops."
8. Bottle	Ice Cream	"The bottle is floating in the water."
9. Dog	Swamp	"The dog is playing in the mud."
10. Glass	Pink House	"The glass is broken in the pink house."

Table 2

Information used by the participants in Experiment 2

Training Phase: Babar

Words to be Remembered	Location	Associations provided by the Experimenter
1. Ring	Family	"The mother elephant is wearing a ring in her nose."
2. Wagon	Bicycle	"The bicycle is pulling the wagon."
3. Scarf	Giraffe	"The giraffe is wearing a scarf."
4. Flower	Monkey & Bird	"The monkey is giving the bird a flower."
5. Ghost	Train	"The train is chasing a ghost."
6. Candle	Kangaroo	"The kangaroo is jumping over the candle."
7. Pillow	Camel	"The pillow is being the camel's hump."
8. Fruit	Hippos	"The hippos are eating the fruit."
9. Fish	Alligators	"The fish is swimming around the alligators."
10. Smoke	Castle	"The smoke is floating around the castle."

Words to be remembered in the Transfer Phase with Candyland:

1. Ball 2. Frog 3. Dog 4. Smoke 5. Hat

6. Boy 7. Flower 8. Boat 9. Monster 10. Bicycle

Figure 1. The gameboard for Candyland.

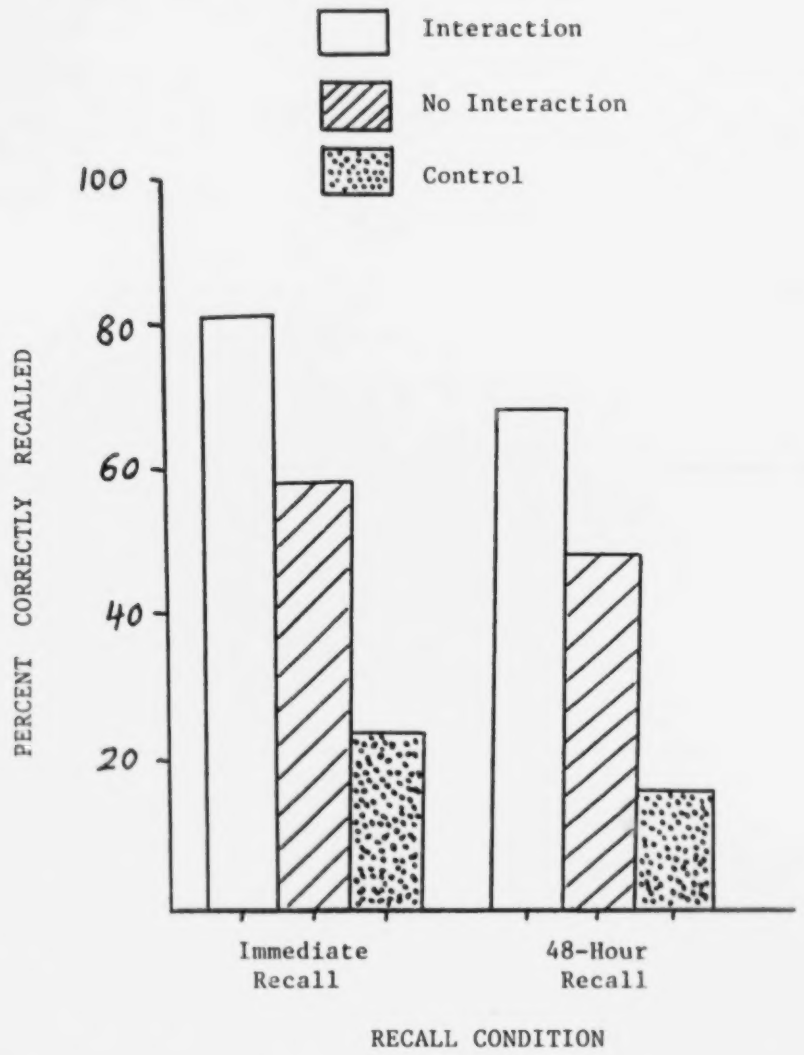

Figure 2. Percent of words correctly recalled as a function of mnemonic condition and recall interval in Experiment 1.

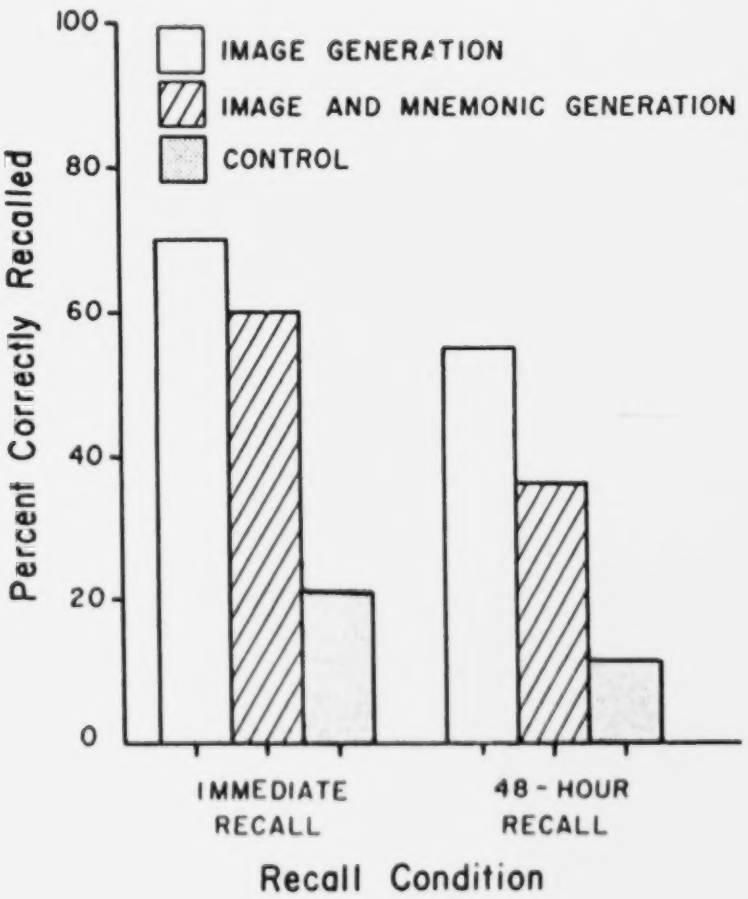

Figure 3. Percent of words correctly recalled as a function of mnemonic condition and recall interval in Experiment 2.